

Tyurin Egor Dmitriyevich

student

Rossiyskiy Ivan Alekseyevich

student

Scientific adviser

Ioffe Nina Evgenyevna

senior lecturer

MIREA – Russian Technological University

Moscow

**MODERN TECHNOLOGIES IN EDUCATION:
CLASSIFICATION, EFFECTIVENESS, AND INTEGRATION STRATEGIES**

Abstract: *this paper examines modern educational technologies across six functional categories: learning management systems, artificial intelligence tools, virtual and augmented reality, gamification platforms, cloud collaboration tools, and MOOC platforms. Based on empirical research from 2021 to 2025, the study evaluates the effectiveness of each technology type, identifies key implementation challenges, and proposes an evidence-based framework for strategic technology integration.*

Keywords: *modern educational technologies, artificial intelligence in education.*

Тюрин Егор Дмитриевич

студент

Российский Иван Алексеевич

студент

Научный руководитель

Иоффе Нина Евгеньевна

старший преподаватель

ФГБОУ ВО «МИРЭА – Российский технологический университет»

г. Москва

СОВРЕМЕННЫЕ ТЕХНОЛОГИИ В ОБРАЗОВАНИИ: КЛАССИФИКАЦИЯ, ЭФФЕКТИВНОСТЬ И СТРАТЕГИИ ИНТЕГРАЦИИ

***Аннотация:** в статье рассматриваются современные образовательные технологии по шести категориям: системы управления обучением, инструменты ИИ, виртуальная и дополненная реальность, геймификация, облачные инструменты и платформы MOOC. На основе анализа исследований 2021–2025 гг. оценена эффективность и предложена модель интеграции.*

***Ключевые слова:** современные образовательные технологии, искусственный интеллект в образовании.*

Introduction.

Digital technologies have transformed education globally. The 2020–2025 period saw accelerated adoption driven by the pandemic and emerging AI/immersive technologies [1; 3]. However, many institutions adopt tools reactively, yielding inconsistent results. This paper classifies educational technologies, evaluates their effectiveness (2021–2025), and proposes an integration framework.

1. Classification of Modern Educational Technologies.

The diversity of available technologies can be systematized into six functional categories, each addressing specific educational challenges (Table 1).

Table 1

Classification of Modern Educational Technologies

Technology Category	Examples	Primary Functions	Application Domain
Learning Management Systems	Moodle, Canvas, Google Classroom	Course management, assessment, analytics	All disciplines
Artificial Intelligence Tools	ChatGPT, adaptive tutoring, Grammarly	Personalized learning, automated assessment	All disciplines
Virtual/Augmented Reality	Meta Quest, HoloLens, Labster	Immersive simulations, virtual labs	Medicine, engineering, sciences
Gamification Platforms	Kahoot!, Quizlet, Quizizz	Engagement, formative assessment	All disciplines
Cloud Collaboration Tools	Google Workspace, Microsoft 365, Miro	Real-time collaboration, project management	All disciplines
MOOC Platforms	Coursera, edX, Stepik	Scalable content, self-paced learning	All disciplines

Categories often overlap, but this framework enables systematic evaluation.

2. Learning Management Systems and Cloud-Based Platforms.

LMS platforms form the foundation of digital education. A study of 450 universities in 32 countries found 94% used at least one LMS by 2024 (vs. 67% in 2019) [1]. Effectiveness correlates with instructor digital competence: teaching skills directly predict quality ($\beta = 0.43$, $p < 0.001$), mediating institutional support and student outcomes.

3. Artificial Intelligence in Education.

AI integration (2023–2025) is highly transformative. A meta-analysis of 51 studies found large positive effects on academic performance ($g = 0.867$) and moderate effects on critical thinking ($g = 0.457$). AI tutoring improved exam scores by 19%, especially for lower-performing students. Key risks include academic dishonesty, reduced critical thinking, and algorithmic bias. The digital divide may exacerbate inequalities [2].

4. Virtual and Augmented Reality Technologies.

A meta-analysis of 42 VR studies in higher education showed moderate learning outcome effects ($d = 0.54$) and strong motivation effects ($d = 0.78$). Medical education leads adoption: VR surgical simulations show 65–80% skill transfer to clinical settings. AR in physics labs improved conceptual understanding by 23%. Barriers include hardware costs and limited content, though headset prices declined from \$600 (2020) to \$250 (2025).

5. Gamification and Interactive Learning Platforms.

A meta-analysis (2008–2023) confirmed moderate positive effects on performance ($g = 0.782$, $p < 0.05$), stronger in short-term interventions. Competitive elements may demotivate lower-performing students. Intrinsic motivation elements (narrative, exploration) yield more durable engagement than extrinsic rewards (points, badges).

6. Comparative Effectiveness and Implementation Challenges.

Consolidated analysis reveals significant variation in impact by educational domain and implementation quality (Table 2).

Comparative Effectiveness of Educational Technologies

Technology	Effect Size (g/d)	Strongest Impact Area	Key Limitation
AI Tutoring Systems	$g = 0.867$	Academic performance	Academic integrity risks
Virtual Reality	$d = 0.54/0.78$	Practical skills, engagement	Hardware costs
Gamification	$g = 0.782$	Short-term motivation	Novelty decay
Flipped Classroom	$d = 0.41-0.64$	Conceptual understanding	Requires self-regulation
Cloud Collaboration	$d = 0.35-0.52$	Writing quality, teamwork	Uneven participation
LMS Platforms	$d = 0.20-0.40$	Course organization	Depends on instructor skills

Only 38% of faculty report feeling adequately prepared to integrate technology meaningfully. Novelty effects typically diminish after 8–12 weeks, requiring ongoing content refresh. The flipped classroom model has emerged as the most consistently effective integration strategy, confirmed by a synthesis of 70 studies from 19 countries.

7. Recommendations.

Institutions should adopt strategic, pedagogically-aligned technology choices. Instructor training must precede deployment-effectiveness depends on usage, not tools. Phased implementation reduces cognitive overload: introduce one category per period, evaluate, then expand. AI tools require explicit policies; assessments should adapt to technology-enhanced learning.

Conclusion.

Modern educational technologies significantly enhance learning outcomes when strategically integrated. AI tools demonstrate the largest effect sizes but require careful management of academic integrity risks. VR/AR show strong motivational benefits despite adoption barriers. Gamification and cloud collaboration provide consistent moderate gains. LMS platforms remain essential infrastructure, with effectiveness dependent on instructor digital competence.

References

1. Almaraz-López C. A systematic review of the adoption of learning management systems in higher education / C. Almaraz-López, C. Alcázar-Cáceres, A. González-Marcos // *Education and Information Technologies*. – 2024. – Vol. 29. No. 5. – P. 5423–5452.
2. Baah C. Exploring the role of gamification in motivating students to learn / C. Baah, I. Govender, P. Rontala Subramaniam // *Cogent Education*. – 2023. – Vol. 10. No. 1.